THE OPTICAL

MAGIC LANTERN

JOURNAL

AND

PHOTOGRAPHIC ENLARGER.

EDITED BY J. HAY TAYLOR.

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NOTICE.

MANY CORRESPONDENTS STILL FORWARD THEIR COMMUNICATIONS TO THE OLD ADDRESS. WILL THEY PLEASE NOTE THAT OUR ADDRESS IS NOW

56, CHANCERY LANE, LONDON, W.C.

Notes.

IN the course of some experiments with the electric search light, it has been ascertained that when the light has been projected upwards at an angle of 45° the reflection can be seen in the air at a distance of ninety miles.

* * *

A NEW set of 54 slides, which should be of particular interest to the public at large, has been published by Messrs. Archer & Sons, Lord Street, Liverpool. They represent "Slum life."

* * *

THAT ether is capable of causing sad havoc when used in a careless manner, users of saturators are doubtless aware. About a fortnight ago a photographer in Paris dropped a jar of collodion; his assistants immediately commenced to mop it up, but having omitted to open the windows, the fumes reached a stove in an adjoining room, and fired, with the result that the building took fire, and it was afterwards ascertained that two people lost their lives.

* * *

OPTICIANS will no doubt be astonished when they see at work at the Chicago Exhibition a new invention, which will make lenses four hundred at a time.

* * *

THE Manchester Photographic Society make it a rule that at their open lantern meetings, no one member is allowed to exhibit more than 18 slides.

INSTEAD of the illuminant being fastened to the body of a triple or bi-unial lantern, Mr. H. C. Newton has worked out an idea for securing it to the lantern front. In this way, when the fronts containing the optical parts are tilted, the illuminant still remains in the optical axis of the system.

* * *

Invention describes a simple form of praxinoscope as follows:—"Take two negatives of the same person, but in two different positions; for example, taking water at a pump. In the first picture the arm should be raised, then lowered in the second, and the two attitudes of the individual will be in relation with the two positions of the arm of the pump. From these negatives make prints, and place the two images on the opposite surfaces of a piece of cardboard, the two images being reversed with reference to each other. Tie a string on each side of the cardboard, and, by twisting it between the fingers, you will cause the cardboard to revolve rapidly, and obtain the sensation of the motion of a person pumping water.

* * *

MR. A. R. Dresser has taken about three hundred hand camera negatives of scenes in connection with Buffalo Bill's entertainment, and intends to issue sets of lantern slides of same.

* * *

NEW words are continually being applied to the photographic art-science. The latest is supplied by Messrs. R. & J. Beck in connection with their new hand camera, which is termed the Frena. The picture that is taken with it is a Frenagraph; the person taking it, the Frenographer, and the particular solution which they advocate for a developer, Frenole.

* * *

THE Thornton-Pickard Manufacturing Co. (late St. Mary's Street, Manchester) having just completed a fine factory and offices at Altrincham, near Manchester, have moved the whole of their business under one roof. The factory has been fitted with the best machinery and appliances for the manufacture of their well-known shutters, cameras, lenses, &c.

* * *

A COUPLE of days before going to press, we attended the opening of the Exhibition of the Photographic Society of Great Britain, 5a, Pall Mall, and those who visit it cannot fail to be delighted. The hours are from 10 a.m. till 5 p.m. On Monday, Wednesday, and Saturday evenings, the Hall will be open from 7 to 10, when slides will be projected by the lantern.

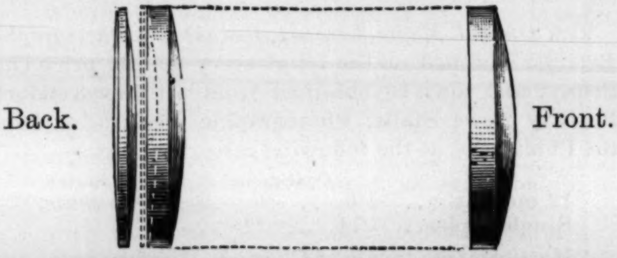
Flatness of Field.

THIS is a term which is understood by most lanternists, but as our readers are of all classes—inexperienced as well as experienced—a few words to the former, descriptive of the term, may not be out of place.

Roundness of field is discovered when the picture is projected upon the screen. The centre appears perfectly sharp, whilst the sides are indistinct, and if the lens be racked until the image at the margins is sharp, the central portion appears blurred and indistinct.

In single lenses, rays entering at the margins come to a focus closer to the surface than those which pass through the lens nearer the centre, and, as a consequence, there are several focal points according to the different parts of the image. Some of this indistinctness may be remedied by using a stop, or diaphragm, in conjunction with the lens, thus causing marginal rays to be cut off, the image then becomes shapened, but at the expense of light.

The well known Petzval portrait lens is in general use for lantern work. Many lenses of this type give a somewhat round field, this may be remedied to some extent by a slight judicious alteration. Between the two lenses of the back combination will be found a ring of metal, which serves to keep the parts from touching each other. In many cases flatness of field may be improved by reducing the thickness of the ring, thus causing the elements, of which the back combination is formed, to be brought closer together.



The lenses are secured in cells, and these in turn are screwed into the brass tube which forms the mount. Some makers secure the lenses in the cells by a ring screw, and when finished in this style, it is a simple matter to get at the back combination so as to reduce the thickness of the separating ring spoken of. Other makers burnish the glasses in, by turning over the edges of the cells, and in this case, some experience is required to get the lenses out of their mounts.

In the case of the burnished in lenses, it is well, before again fastening them permanently, to ascertain with accuracy that the lens has been altered to its best capabilities.

The question next arises, how is it to be tested for flatness of field. It is not sufficient that a photographic transparency be employed for the purpose, although it has been advocated that a good means of testing is to transfer an ordinary engraving to glass, by causing it to adhere to its surface, and then rubbing away the paper from the back, until it becomes transparent, and using this as a slide. But by far the best method is a slide recently made and introduced by Mr. C. Goodwin Norton. He inserts in front of the condenser, a test slide, formed by a piece of Brussels net tightly stretched between two thicknesses of glass. With a slide thus formed, we are enabled to ascertain if the lens will give absolute sharpness up to the edges of the slide. By projecting this in the usual manner, one is able to judge at a glance the capabilities of his lens for projecting pictures with flatness of field.

—:o:—

Hand-Cameras for Obtaining Slides for the Lantern.

	"Facile"	(Fallowfield)	see March 1st, 1890
No. 1	"Giah"	(Mawson & Swan)	,, May 1st, ,,
,, 2	"Quadrant"	(W. H. Humphries & Co.)	,, June 1st, ,,
,, 3	"Eclipse"	(J. F. Shew & Co.)	,, July 1st, ,,
,, 4	"Eureka"	(W. W. Rouch & Co.)	,, Aug. 1st, ,,
,, 5	"Key"	(Platinotype Co.)	,, Sept. 1st, ,,
,, 6	"Optimus"	(Perken, Son & Rayment)	,, Oct. 1st, ,,
,, 7	"The Griffin"	(Griffin & Sons, Limited)	,, Nov. 1st, ,,
,, 8	"The Swinden-Earp" Patent		,, Dec. 1st, ,,
,, 9	"Collins"	(C. G. Collins)	,, Feb. 1st, 1891.
,, 10	"Kodak"	(Eastman Co.)	,, Mar. 1st, ,,
,, 11	"Guinea"	(Walter Griffith)	,, April 1st, ,,
,, 12	"Vanneck"	(Watson & Sons)	,, May 1st, ,,
,, 13	"Chadwicks"	(W. I. Chadwick)	,, June 1st, ,,
,, 14	"Bonanza"	(R. & A. J. Mercer)	,, July 1st, ,,
,, 15	"Repeater"	(J. F. Shew & Co.)	,, Aug. 1st. ,,
,, 16	"Marvel"	(Wilson & Son)	,, Sept. 1st. ,,
,, 17	"Talmer"	(Talbot & Eamer)	,, Oct. 1st, ,,
,, 18	"The Omnigraph"	(J. Lancaster & Son)	,, Nov. 1st, ,,
,, 19	"Ubique	(Perken, Son & Rayment)	,, May 1st, 1892.
,, 20	"Daylight Kodak"	(Eastman Company)	,, June 1st, ,,
,, 21	"The Radial"	(Marion & Co.)	,, July 1st, ,,
,, 22	"The Surprise"	(Levi & Co.)	,, August 1st, ,,
,, 23	"Perfect"	(W. Tylar)	,, Sept. 1st, ,,

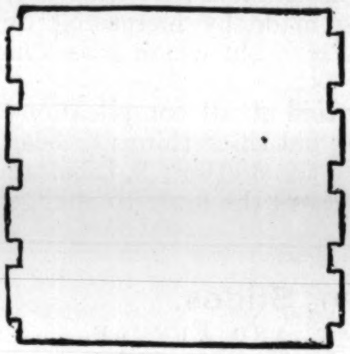
No. 24 "FRENA."

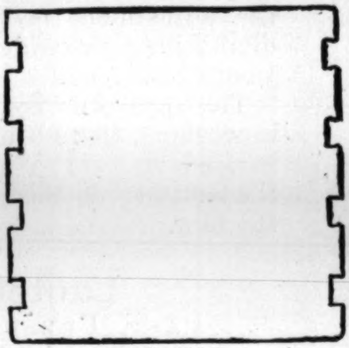
THE "Frena" hand camera, which has been introduced by Messrs. R. and J. Beck, Cornhill, E.C., is totally different in action to any camera which we have hitherto tried.

It measures 8¼ × 4½ × 6¼in., is supplied with finder, shutter for various rapidities of exposure, film changer, and swing back arrangement.

The films for this camera are put up in packets of 40 each, and are of a peculiar form. Between each film is a piece of thin and stiff cardboard of the same general pattern as the film (see figs. 1 and 2).

The packet containing the film and cards is placed into a reservoir inside of the camera, in which they rest on teeth; when the first one will be opposite the lens ready for exposure. The reservoir is held on pivots inside of the camera, and is connected with a handle outside. To change a film after exposure, the spring *k*, Fig. 3, is liberated, and the handle *h*, moved backwards; this causes the teeth on which the film rests, to move slightly to one side, and the film to fall, and as soon as the handle is carried a little beyond the projection *m*, the card also is displaced. Upon the handle being brought back to its normal state, another film is ready for exposure. This is repeated until the 40 films have all been exposed.


Film. Fig. 1.


Card. Fig. 2.

After exposure, the films with their cards can be taken out of a reservoir below, in which they have been automatically kept from shifting.

As each film is changed, its number is indicated by the appearance of a figure at *n*.

On the upper part of the changing handle or lever is a level, *l*. This not only enables one to ascertain if the camera itself is level, but it also acts the part of a swing back. If the camera be pointed slightly upwards, the handle may be pushed forward, when the level will indicate when the sensitive surface is vertical. This device will be found particularly useful.

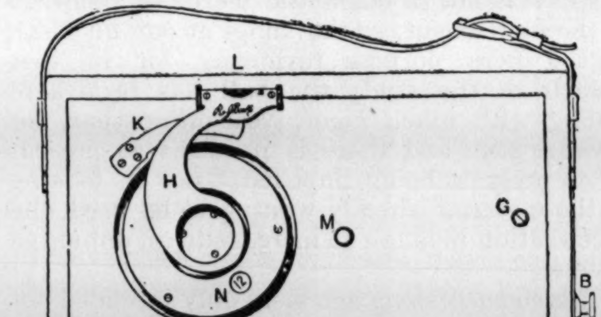


Fig. 3.

The camera has a finder and a RR lens. Respecting this latter, nothing need be said, excepting that it is made by this firm, who enjoy a high reputation for the excellence of all their optical goods.

The shutter is of peculiar formation. It always travels at the same speed, but is capable of giving exposures with great certainty, from varying fractions of a second to a time exposure, the adjustment being made by increasing or diminishing the width of a slit which passes in front of the lens.

The apparatus is devoid of all complications in working, there being but three things to bear in mind, viz.:—1, Wind the shutter; 2, Liberate the shutter; 3, Push down the lever to change the film.

—:o:—

Lantern Slides.

PAST, PRESENT, AND FUTURE.

By REV. JOHN ST. JOHN.

WHAT an old boy I am beginning to think myself, and I might add, feel myself, for it's bordering on the shady side of forty-five years since I first made friends with the Magic Lantern, and even then I had past my boyhood. Observe, kind reader, I said, "Magic Lantern," for in my early days, that was the sole modest appellation by which it was known, and by which I, for one, love to know it now. But looking through the various vendors' catalogues, guide books, and even the advertisement pages of our "up to data" scientific literature, the many fan-dangled names given to the lantern is appalling.

But it is not so much the merits or demerits of the instrument, as the slides at our disposal, that I here purpose reviewing, for in that branch of the study the ball has been kept rolling with much vigor, year after year, for decades past, and there is no signs at present of its progress being impeded. For in looking at the material already waiting to be used, the acceleration bids fair to increase to an unlimited degree.

The slides of long ago were only intended for what they accomplished—amusing the children—whereas, the slides of to-day not only amuse the child, but give learning to the Eton boy, and the graduate at Oxford, add to the physician's knowledge, help the botanist, encourage the students of zoology, astrology, geography, electric and magnetic physics, and a host of other sciences. The sculptor can enjoy in his private room the works of the greatest masters from every corner of the globe; and, without travel, the painter can cover his canvas with pictures from nature.

The slides of the past were but a daub in comparison to the productions of the present. Then we painted our hob-goblins, fairies, pigmies, or whatever was popular in the youthful mind, on a bit of glass in a crude, schoolboy fashion; but in these days of reform we get, for a few pence, a finished, artistic article, such as we could not have dreamed of in the old days.

Not only can we boast of knowledge of the wonders of the microscope, but positively possess a picture of our old friend the lady-bird—before she donned her spotted crimson coat—in her grub form, busily engaged in the rose bush, destroying the minutest of pests of the favourite plant. We can boast, too, of the thousands of Nature's objects, the actual wing of a dragon-fly, with its intricate structures, which in life moves with such amazing rapidity, that the puzzle is, how it is held together.

The lantern slide of my early days was but a toy, at the present time it is a work of art, a great teacher and a powerful preacher. Who can say what its future mission may be.

I will just mention two or three subjects that will undoubtedly and unreservedly claim the slide makers attention. One of the first being, the colossal Chicago Palace of next year. Those of us whose privilege it was to visit the French Capital in 1887, and see for ourselves the greatest show the world has ever seen, will regret our inability to meet the folk on the other side of the fish pond, and congratulate them on their pluck—for we are informed in many particulars they intend to outdo their French brethren. But I, for one, mean to rest content, for I guess as soon as the doors are thrown open, in will rush the friends of the camera, and after that, in due course, will follow my set of slides, which at once will be introduced to the Oxy-hydrogen (Oh, I beg pardon, I should have said, Magic) Lantern, and if they compare favourably with the very beautiful set of the year of '87 (which are before me as I write), I shall be more than satisfied.

Speaking of exhibitions, I would just make a passing reference to a conference which took place at the Paris Observatory, on the 1st ult., led by M. Francois Deloncle, as to the advisability of constructing a telescope which will bring the moon visually within four miles of the earth. This gigantic instrument, intended for the Exhibition of 1900, is to be as large as the Vendome Column in extent, and is to have a reflecting mirror weighing no less than nine tons, whilst its general appointments will be on a similarly immense scale. It is too early to predict the success of such a wonderful undertaking, but I entertain a confidence that if the project is decided upon, all difficulties will be conquered in the way of its achievements.

The Rev. John Joseph Nouri, D.D., LL.D., the Chaldean Archdeacon of Babylon and Jerusalem—who is also Pontificial Delegate General of Nedabor and Ex-Grand Secretary of the Metropolitan Archdiocese of Persia and India—has lately arrived at San Francisco, and has positively assured an interviewer that he has seen the veritable ark of Noah — the veritable ship of scriptural history. This learned gentleman has been gathering facts for some years past for a great ecclesiastical history of the eastern church throughout the world. The eminent traveller tells how his party proceeded to ascend to the top of Mount Ararat. The smaller of the two horns is estimated at 16,000 feet high, but their ambition was not satisfied until the larger of the mountains had been attempted, which is 18,000 feet in altitude. "After waiting some weeks," says our authority, "we were abundantly paid for all our labor, for we discovered what I feel sure was the ark, the actual work of Noah. I discovered it myself, being the first to see it. I saw it through a field glass at first; though we got so close to it that it was visible to the eye alone." Then the rev. gentleman gives a detailed description of the ark, "which was," he says, "300 yards long and 100 feet high. The wood which was a dark reddish, almost iron coloured and very thick. I thoroughly assured myself, gazing long and repeatedly at different parts of the great craft, that once for forty days and forty nights had on board of it every living and creeping animal and insect, and every flying thing in the world.

"At length I called the attention of my companions, who had arrived on the scene, to it, and they examined it critically, and all admitted that they saw the vessel, the veritable ark of Noah."

I hope to hear more of this alleged discovery, for if its interest can be maintained, the lantern slidest will not be backward in giving us the old story in new clothing. Fancy having the pleasure of directing the attention of your audience to the screen and saying:—This picture ladies and gentlemen demonstrates that—

"The animals went in two by two,
The lively flea and the kangaroo."

and so on, and so on.

Far be it from me to doubt the word of the gentleman spoken of, but it is a pity he had not taken a small camera with him, it would have been more convincing.

Amateur photographers are now to be found in every town in the Kingdom, and they are beginning to find out that there is no better method of showing their friends the picture they have taken, than by means of the optical lantern. T. C. Hepworth.

A cheap Portable Lantern Frame and Screen.

By George Kilburn.

Now that the lantern season is once more upon us, each one interested in lantern work will be busy preparing for the long winter evenings. For the benefit of those who are in want of a cheap, as well as a portable lantern-frame and screen, I herewith give particulars of one I have just made, and which anyone can make for themselves.

Procure one dozen ash broomsticks, plain, without turned-heads, at 3s. 6d. a dozen, 50 inches long. Get your local tinner to make 8 sockets, 6 inches long, to fit the broomsticks. Also 4 angle pieces same length for the corners. You can use the sticks full length, or cut them to 48 inches, and fit them to the sockets. Screw the sockets fast to one end of the sticks, leaving one end loose, to allow for taking to pieces for convenience in packing up.

When all the pieces are fitted together we will have a frame 12 feet square, or by leaving out one piece on each side, it will make an 8 feet frame, suitable for an ordinary room or small school. If all the pieces are sandpapered and varnished with oak varnish, it forms a nice frame fit for any room or company.

Sheeting, suitable for showing lantern slides on, can be had from most drapery establishments. Mine is best strong bleached sheeting cotton, (plain not twilled) costing 1s. 9d. per yard, 108 inches wide. Procure some of same quality about 40 inches wide, cut it down the centre; this will give two pieces of proper width for sewing to either side of the wide piece. Next make a hem at one end, and on one side, wide enough to allow the poles to slip through, and put tapes on the opposite sides to the hems. This forms a frame and sheet which can be put together in a few minutes by anyone, and packed up as readily.

For the benefit of those who want the prices of each article before commencing to make one, I append the prices which I have paid viz:—

	s.	d.
1 dozen ash broomsticks	3	6
8 straight and 4 angle tin sockets 6 ins. long	1	9
4 yds. strong bleached sheeting 108 inches wide @ 1s. 9d.	7	0
4 yards ditto, 30 inches wide, @ 7d. a yard	2	4
Varnish	0	6
Tape	0	6
Total cost	15	7

Common Fallacies in the Gas Services to Lanterns.

By D. W. Noakes (Greenwich).

The appearance in the July number of the *Optical Magic Lantern Journal* of a cut representing an alleged patented stop valve, has brought strongly to my mind some of the fallacies which seem to exist in regard to gas services to lanterns—some of which even opticians seem inclined to foster. We have a strong instance of this in the valve above mentioned, which, so far as I can gather, is designed to go between the gas cylinder and any of the various automatic regulators.

The chief advantage claimed seems to be that the gas service can be closed without shutting the cylinder valve—though why on earth the cylinder valve should not do its own work, I fail to see any reason.

We are told that if jet cocks are all adjusted the stop valves open the gas services to the lantern without hissing in such a way as to unsettle the audience, make them fear a blow-up, perplex the lecturer, &c., &c.; and the point is strongly pressed as if the ordinary cylinder valve was incapable of doing the same service. The valves also possess several other similar applications, but to my mind, apart from the fact of an inviting milled head at the service of the itching fingers of every inquisitive enquirer, and an extra joint to keep gas tight, it is wrong practice to in any way throttle the service of gas to the regulator.

It is a very common fallacy, engendered, no doubt, before regulators came into general use (when the consumption of gas was controlled entirely at the cylinder valve) to open the cylinder valve insufficiently, and to practically cut out the whole usefulness of the regulator.

Regulators have been returned to be tested over and over again, which have been ultimately found to be in capital working order. Remarks have also accompanied them to the effect that the user was very careful to turn on the cylinder only a very little, then when dissolving, the lights jumped up and down. Sometimes we are told they work beautifully, and at other times are useless. The user no doubt speaks correctly, in the one instance the governor has been working, in the other its usefulness has been completely destroyed by an insufficient service of gas.

It does not seem to be clearly understood that for a governor to work efficiently, the cylinder valve must be opened to pass more gas than can be consumed by the maximum number of lights the regulator is called upon to supply. Some gas is required over and above the greatest possible consumption to work the mechanism of the regulator.

A very general idea seems to prevail that by only partially opening the cylinder valve, the governor is relieved. The fact is unless the governor is being actuated by the whole pressure in cylinder, it is really cut out of service, and becomes simply a channel, or so many inches added to the usual rubber tubing. To illustrate my point—in a triple lantern the demand on the regulator is constantly varying, sometimes sufficient gas for one light, sometimes for two, and other times for three, consequently at *all times* the cylinder valve must be sufficiently opened to allow the regulator to rather more than serve three lights, a slight margin in excess being necessary to avoid fluctuation on the reduced pressure side, and to work the reducing valve. It will thus be seen that the accumulated pressure in the small aperture immediately below the governor valve, and above the cylinder valve, is probably at nearly all times equal to the maximum pressure in the cylinder, and unless these conditions are present, the governor will not be able to work efficiently.

Without doubt, the period during which a regulator suffers most strain, is when all outlets connected to the regulator are closed, and the cylinder valve left open to the regulator. Then, if the valve of the regulator is not absolutely tight (and very few are after a little use), it is easy to see that the pressure will gradually increase in the regulator, and if the conditions are observed sufficiently long, and good tight sticking rubber tube is used, injury to the regulator may result.

The remedy of shutting the cylinder valve is so simple, and conforms so well with what is usually required in actual practice, that there is no need for the regulators to be subjected to any such conditions, except for very short periods.

In practice the best method is to carefully adjust the one, two, or three pairs of jet cocks, or *screw down* intermediate regulators, as the case may be, and when lantern is not in use, to close the oxygen cylinder valve, the little gas contained in the regulator is used up and the regulator is practically at rest.

If compressed hydrogen is used, and the interval before lantern is required is not exceptionally long, it is better to leave the hydrogen turned on and the bye-passes burning, this will keep lenses from steaming and limes warmed up to avoid cracking. If suddenly the lantern is required, all that is necessary in a bi-unial or tri-unial, is to set the dissolver to pass gas to the first lantern required, open the hydrogen cocks on back tubes, turn on the oxygen at cylinder, and slowly open the oxygen cock on back service tube. In this way my bi-unial or triple lanterns stand ready at every exhibition, and as the electric light is switched out in the hall, so I as silently switch our introductory picture on the screen, in some cases the introductory picture being composite, and requiring two or more lanterns for its projection. An operator or apparatus not capable of projecting silently the introductory picture on the screen, should not be tolerated at any public entertainment.

It is a common fallacy that the hydrogen governor suffers undue strain whilst only passing sufficient gas for the bye-passes, but this is not so, whilst the bye-pass cocks are open the governor is only subjected to the usual working strain, as a faulty governor leaking anys faster than the consumption of the bye-passes would be unworkable.

Another fallacy also seems to exist, that a faulty governor passing more gas than is consumed, can be corrected by putting a cork on the outlet. The usual result of using a faulty governor is the blowing off of the flexible connecting tubes caused by the valve not closing tightly, and permitting gas to pass faster than consumed, thereby causing pressure to accumulate sufficient to expand the flexible tube to a larger size than the brass connections. It is absolutely useless to put a cock on the outlet tube, the gas must escape, and if stopped by a cork at the proper outlet, it will find an improper outlet at the weakest part of the regulator. The only cure in a case of this kind, is to have the valve put in order if faulty, or if particles of dust or any material prevent the valve from accurately bedding these of course must be removed.

A good many regulator valves act imperfectly through particles of any kinds of matter getting blown up the stem and on to the valve seat, thus preventing the valve from closing. I have even found pieces of straw, string, brick-dust, and materials of many kinds such as are likely to collect and lodge in the outer part of cylinder valve during transit. It is, therefore, good practice before connecting the regulator, to carefully wipe the seating on cylinder, and turn on the gas sharply for a second, to blow out any dust that may be present.

Yet another fallacy, and a very common one, viz., the use of grease, soap, beeswax, white lead, &c., to stop leakage around the screw which connects regulator to the cylinder—it is utterly futile—the only way to make an absolutely tight joint is to bed the bull nose in stem accurately in the valve seat on the cylinder, and if this is not done, neither beeswax, soap, nor any other stopping material will arrest the leak. In transit, particles of all kinds of matter get lodged in the cylinder valve, and nineteen times out of twenty, a dirty seating is the cause of a leaky connection. Although, of course, now and then a leakage is caused by injury to either the valve seating on cylinder or the stem on regulator. The firm of which I am a member, have been supplying leather cone washers, the shape of the seating which admit of a tight joint being made with less pressure applied to the usual differential connection, and adds much more life to the stem and seating.

As we are discussing cylinders, I would also like to refer readers to a quotation from "Practical Hints to Practical Lanternists," of which I am part author.

"A word here about cylinders will not be out of place, and users are warned not to oil or grease their fittings, nor use gauges that have been tested with oil. Compressors also advise that separate gauges should be used for oxygen and hydrogen, as gauges have been exploded in practice through the above-mentioned causes; but, we believe, and are continually advising our clients that all source of trouble is removed if, before attaching the gauges, the valve of cylinder is slightly opened. The least little bit will do it, and then, instead of the hand of the gauge being knocked round with the sudden impact which occurs when a sticky valve is suddenly opened, it will go round slowly, and subject the gauge to no undue strain. The sudden impact that probably explodes any oil or hydrogen contained in the gauge is thus avoided."

In spite of my instructions, it has come to my knowledge that assistants who have well known the fact, have neglected this simple precaution, and serious results have followed. In order to prevent the recurrence of accidents through the above cause, I am now making the subject matter of a patent, a little inexpensive devise that can be fitted to any existing gauges, which I believe will put it out of the power of any operator, either through ignorance, or carelessness, to explode a gauge.

Gauges are not the only things that suffer by reckless opening of the cylinder valve, great strain at times is put on the regulators in the same way.

Method and order should always accompany all lantern work, and too great care cannot be taken over the gas services to lanterns. The regulators, flexible tubing, dissolver and jets, should all be of the very best description. Since the use of compressed gas has become general, faults in the above pieces of apparatus have become apparent, where before they were unnoticed; this, no doubt, being caused by the pressure given off by the regulators being double that of the old bag pressure. Many dissolvers and jets of inferior make sent to be adjusted, have come under my notice, and although they worked fairly well when bags were used, they only cause trouble and extreme disappointment when used with compressed gas.

It cannot be too clearly understood that the importance of attachments to the rear of the lantern becomes intensified when compressed gas is used. Only the very best flexible tubing should be used, of right bore and substance, and not the usual commercial gas tubing. The tube should not be porous or hard, but fully elastic and about 3-16 in. bore. The flexible tubes should not be tied or wired on to the brass connections, but should of itself grip sufficiently to keep gas tight under proper conditions, and should be perfectly free to fly off under improper conditions.

When the lantern is ready for the gas connections to be made, the cylinders should be stood up on end, the valve seat wiped clean, the key applied to valve, and the valve opened sharply for a moment so as to blow out the passage leading to the valve seat. After doing this, do not jamb the valve down, but leave it free and easy to open. The cone washers should now be put in, and the winged screw on regulator stem screwed into cylinder neck, not quite home, but with one or two threads left in sight. The body of regulator should then be turned till the round nose on its stem beds on the valve seat of cylinder—or on the washer if one is used—the winged nut should now be screwed up tightly, and the great power given by the leverage of the wings, and the differential screw, will press the regulator stem on to the valve seat of cylinder so that even 1,800 lbs. pressure to the square inch will not leak through.

In order to test if joint is tight, hold finger over the outlet so as to prevent escape, and open the cylinder valve slowly, then by placing ear close to the cylinder valve we can by the sense of hearing detect even a minute leak. If it is round the regulator stem, the winged screw must be tightened down a little more; but if round the steel spindle of a "Chapman" valve on the cylinder, a spanner must be used and the gland nut tightened down.

It is not only a common fallacy, but a dangerous one, to try and find the leak on an oxygen cylinder with a lighted match or taper—it is quite possible to set an oxygen cylinder on fire by so doing—if you cannot locate the leak by the sense of hearing, wipe a litttle spittle round the joint and bubbles will show the exact spot.

Having made the connection "gas tight," connect up to back tube on lantern with the usual flexible tube, and if mixed jets are used, repeat the process with the hydrogen cylinder, seeing that all the intermediate regulators on jets are closed, also the cocks on back service tubes. Limes having been put on jets, set the dissolver to serve one of the lanterns, open hydrogen cock on back tube, then regulator on jet, and light at the nozzle. After once using the jet, somewhere near the actual quantity necessary will be known. Now turn the dissolver for one of the other lanterns and admit in the same way somewhere about the right quantity of hydrogen, at the same time observing if the bye-pass is open and the jet out, but served with sufficient hydrogen to relight. Now turn on oxygen at cock on back service tube, and then slowly open the regulator on oxygen side of jet, adjusting both the quantities of hydrogen and oxygen to give the best light, repeat the process with the one or two other lanterns as the case may be, and, if this is done carefully, not too quickly, even with the jets full of air, no noise or hissing need be made.

As soon as the jets are properly adjusted, turn off oxygen at cylinder, allowing regulator to empty, put the dissolver in position for serving all lanterns, and nearly turn off the cock on hydrogen service tube, leaving it sufficiently open to supply a small flame in each lantern. When the lecture or entertainment is about to commence, close oxygen cock on service tube, and open the cylinder. Set the dissolver right for lantern (or lanterns) to project the first picture. The lantern is then in absolute readiness.

As the electric light is switched out in the hall the operator opens fully hydrogen cock on service tube—then oxygen cock on service tube—and the first picture can be flashed on the screen without noise or hiss of any kind. No lanternist should rest content if his apparatus or his skill will not admit of similar efficiency.

The subject of gas services to lanterns is a large one, and much more could be said. Fortunately, of late years, many lanternists have come into the field, who take great pride in smooth, silent, and efficient working, and I am hoping that ere long the hissing, alarming, and unsettling operator will have read our "Practical Hints" and learned by heart one of our "nibs" which says, "the operator may be seen but should not be heard."

The process of making bromide enlargements from small negatives is very simple. To the professional photographer it is a source of profit, and to the amateur a great pleasure. **G. D. Milburn.**

Lantern Condensers.

By W. I. Chadwick.

When a beam of parallel light A A, Fig. 1, falls upon a convex lens, the rays will be bent towards the centre and made to converge approximately to one point *f*, which is called the principal focus. If, on the other hand, a diverging beam of light proceeded from a point at *f*, the rays could be traced back—that is to say, they would, after leaving the lens on the other side, proceed parallel to A A.

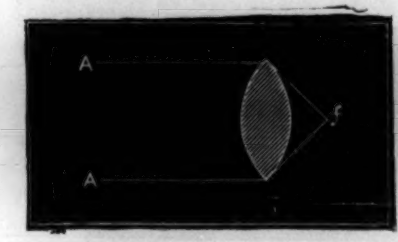


Fig. 1.

If the point of light be brought nearer to the lens than the principal focus *f*, as shown at A (Fig. 2), the lens would have too much work to perform to send the rays parallel, and they would proceed from the lens divergent as B B, though not as much divergent as before they entered the lens.

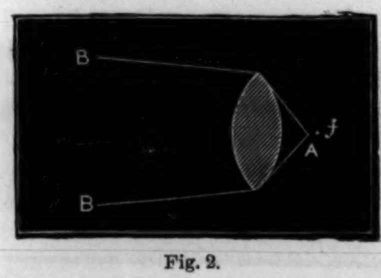


Fig. 2.

When the point of light is outside the focus, as at A Fig. 3, the rays on the other side of the lens will meet at some point B (approximately), and if the point of light be moved to B the rays would meet at A; so we see that A and B are reciprocal, and are called the conjugate foci, one having a distinct relation to the other. As the point of light A Fig. 3 advances towards *f*, the conjugate B will move away from the lens on the other side, but not in the same proportions as A advances, for the longer focus always moves more rapidly than the shorter. If we assume the lens to be 3 in. focus, the conjugates A and B being equal, will be 12 in. apart or 6 in. from thel ens on each side.

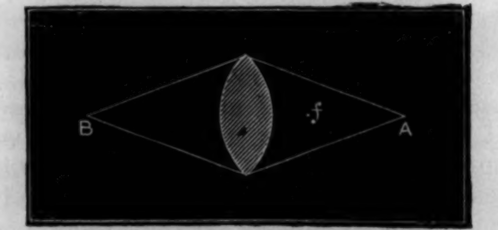


Fig. 3.

In Fig. 4 we have caused the point of light A to be brought nearer to the lens than is shown in Fig. 3, let us say 4 in. The conjugate B has moved further away from the lens—to 12 inches (4 in. and 12 in. being the conjugates of a 3 in. focus lens), and if we move the point of light A still nearer to *f*, say to 3½ in., the conjugate B will be found at 21 inches on the other side, and so on as A approaches the lens, B recedes, until at length when the point of light arrived at *f* parallel rays would be produced as shown in Fig. 1.

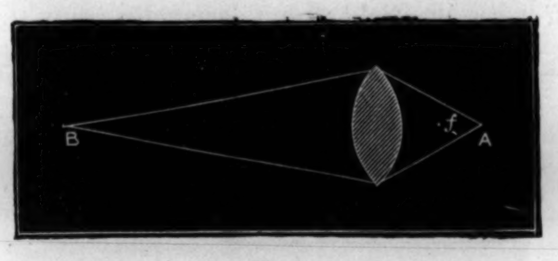


Fig. 4.

Now, let us see how these few remarks apply to a lantern condenser. Ono important function in a condenser is to collect as much light at possible, and in passing it on through the slide, the rays now forming the picture must converge to a point somewhere in front, and that *somewhere* is in or about the centre of the objective in use—that is to say, the objective must be at B Fig. 3, or at B Fig. 4.

When a lantern and screen has been assigned to their respective places, there is only one position for the objective in use to make the picture focus on the screen, and as the conjugate B must meet in the objective, and, as has been shown, this conjugate has another conjugate A, which is the point of light, it is quite clear that the focus of the objective defines the position of the light.

If, then, the condenser be 3 in. focus and the objective 12 in. (or such as would require the conjugate B at 12 inches), then the point of light must be at 4 in. from the lens, as shown in Fig. 4, but if an objective of 6 in. focus be applied the light must be moved back to 6 in., as shown in Fig. 3.

Now the law that "diverging light varies in intensity inversely as the square of the distance," shows clearly that by moving the light back from 4 in. to 6 in. we have lost about one half of it, and demonstrates the fact that whatever be the focus of a condenser best suited to a long focus objective, it cannot possibly be near so good—as a light collector—as a shorter focus condenser would be when shorter focus objectives are employed.

There is a limit to the shortness of focus for a lantern condenser on account of the heat given off by the incandescent lime, and when this limit has been reached for use with a short

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Read at the Stereoscopic Club.

focus objective, the condenser must inevitably break if an objective of longer focus be employed.

Single lenses, such as are shown for simplicity in explanation at Figs. 1 to 4, are never used as lantern condensers for two good reasons, firstly, they would be too thick to stand the heat given off with the light; and, secondly, they suffer from a defect known as spherical aberration, of which we shall have something to say presently.

A Biconvex lens of 3 in. focus and 4½ in. diameter would be about 2 in. thick, and would not stand the heat for many minutes.

Now let us see what two lenses will do.

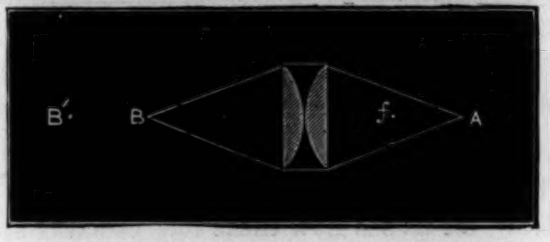

Fig. 5.

In Fig. 5 we have two plano-convex lenses, under similar conditions as explained in reference to Fig. 1; divergent light from a point A immerges practically parallel, and parallel light falling upon the second lens is conveyed to B; here we have very nearly the same conditions as at Fig. 3; but these two lenses, which are each 6 in. focus, are only half the thickness, consequently they are less liable to fracture by heat. If we place the point of light near to *f*, the rays immerging would diverge (see Fig. 2), and these diverging rays, falling upon the second lens, would converge to the conjugate B^1; but these lenses, being of equal diameters, the second lens would not take up all the diverging rays from the first lens, the marginal rays would be thrown into the mount, and therefore lost, as shown in Fig. 6.

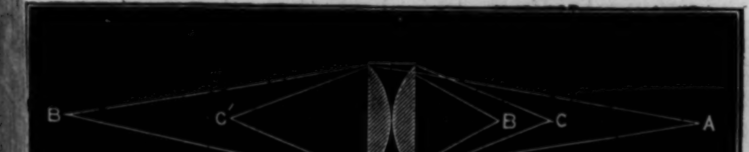

Fig. 6.

Where for a pair of 6 in. focus plano-convex lenses, A B^1 represent the conjugates of the second lens at 12 in. each; C C^1 the conjugates of the pair of lenses, viz., 6 in. on each side; B B^1 the 12 in. and 4 in. conjugates of the pair of lenses, and demonstrates the fact that of a 4 in. diameter front lens only 3½ in. of its diameter is utilised when the 12 in. objective is employed.

If we introduce a third lens, which should be of long foci and consequently very thin, we should be able to get the light within the distance of say 2 in.; this would diverge the rays, and the middle lens would receive the diverging rays and pass them on practically parallel to the last lens, which would converge to the conjugate B^1, as shown at Fig. 7.

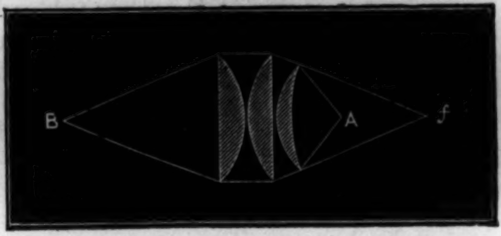

Fig. 7.

The advantage then is that we get a thin lens of suitable focus and diameter close up to the light, and with such a combination as shown at Fig. 7 light may be collected and utilised up to an angle of 95°, which is not possible with any single or double condenser.

Very early in this communication it was said that rays converged *approximately* to one point for, as a matter of fact, no single lens having spherical surfaces has the power to converge rays *absolutely* to one point, so that it is not possible by any single lens to obtain an exact focus.

Sir John Herschel has shown that the spherical aberration may be reduced to one-fourth of that of a single lens in its very best form, by means of two plano-convex lenses having their convex surfaces towards each other, and their radii as 1 to 2·3.

But it was Dolland who, over one hundred years ago, first laid down the principle that spherical aberration of single lenses is proportional to the cube of half the angle of the transmitted rays. But, says Dolland, "if two glasses be so proportioned and situated that the refraction be equally divided, then they will each produce a retraction equal to half the required angle, and therefore the refraction being in proportion to the cube of half the angle taken twice, will be but a fourth part of that which is in the proportion to the cube of the whole angle, because the cube of one is but the eighth part of the cube of two, and so the aberration where the two glasses are rightly proportioned, is but the fourth of what must inevitably be when the whole is performed by only one lens."

Now, by the same reasoning, where the refraction is divided between three lenses, the aberration will be found to be but a ninth of what would be produced by a single lens, because three times the cube of one is but one-ninth of the cube of three.

To those who have followed what has now been said the advantages of a triple condenser for lantern purposes must be manifest.

The condenser which we now introduce to your notice is a triple combination constructed on the lines here advanced, though the foci of the lenses mentioned to illustrate our remarks are not necessarily those we have adopted.

No reference has been made to the density or quality of the glass, or to the various forms of condensers, and some other matters, with a desire not to make this communication too technical.

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Secrets of Success of a Lantern Lecture—No. 1

By William Kirkland.

In alluding to a lantern entertainment when a charge for admission is made, two very important items have to be considered. First the entertainment, as an entertainment, must be a success; and second, from a financial point, a fair balance of cash should result after all expenses have been paid.

A lantern lecture or entertainment, for which a charge is made for admission, cannot be considered "successful" unless these two items have been fulfilled.

It is perhaps a little doubtful whether it can be considered that the lecturer draws the audience, or it is due to the locality of the place of meeting, and the judicious manner in which the inhabitants have the announcement brought to their notice. However, be that as it may, the locality of the meeting-house is in a great measure responsible for success or non success; so above all things it is essencial that a room or hall in the most convenient part of the town or village be secured. Not only must the room be in a good position, but it must be a place that is well known and, above all, must be of good repute.

The place of meeting having been determined upon, the question arises, what shall be the prices of admission? No hard and fast rule can be made about this, so many things depending upon it, but in the majority of cases these can be considered as 1s., 6d. and 3d.

The positions occupied by the relative priced seats is commonly as follows:—1s. seats in front, 6d. seats in the middle, and 3d. seats at the back. Now this arrangement may be all right for a theatrical or conjuring entertainment but for the lantern the order should be entirely reversed. For a well illuminated picture, the further within reason, that one is seated from a large disc the better will the pictures appear; hence, instead of the cheap seats being at the end of the hall furthest from the pictures, that is the part where the reserved seats should be placed. The cheapest seats will of course occupy the immediate front, whilst the intermediate will take the intermediate place.

At such an entertainment as I am speaking of, there will be certain people in the reserved seats who will resent the 3d. people walking past the reserved seats in order to get to their accomodrtion. Of course it is very absurd for reserved seat people to think thusly, but as human nature is at present, it cannot be helped, so the best way is to make them comfortable and humor their fads, and in order to do so, the screen must be so placed in the hall that this is avoided.

In the majority of halls, the door enters from one end, the position for the screen then, is at the same end of the hall as the doors are situated; for, strange to say, there are a number of people who, though proud to be able to walk pass cheap seats into those of a reserved character, object to poor 3d. people walking past their seats in order to get to their places. This, of course, is not as it should be, but it is as it is, as any student of human nature will be aware. The relative comfort as regards stuffed seats and forms need not be dwelt upon.

In the matter of tickets for admission, nothing but the best card and work, combined with neatness of design should be entertained. Slovenly printing always proclaims a cheap style of entertainment. The same remark will also apply to programmes, for nothing looks worse than "the 10,000 copies for 8s. 6d. style" that is now and then met with.

Of course it is necessary that the news of the lecture or entertainment be "noised abroad." This can be done in a variety of ways including show bills, sandwich men, and the display of tickets in as many shop windows as possible, at which places they should be on sale.

Ministers, school masters, and others who are able to influence the populace, should be interviewed, and free tickets forced on them in a delicate way. Their presence, it should be explained to them, "is to lend weight, as they are considered representative folks, &c." Now, as one good turn deserves another, those who have accepted free tickets will naturally put in a good word to their friends about the coming entertainment. It is obvious that by giving away a number of of passes judgematically, and thus, by the action of wheels working within wheels, a good paying audience may be obtained. It is well to arrange to give the shopkeepers who exhibit bills and sell tickets, a couple of passes for their trouble. With reference to the price of seats that are given as recompense for this I shall not suggest, but leave it to the good sense of the management. In some cases it has been the practise to give tickets for cheap seats, knowing full well that the difference in price between these and reserved ones will be paid, but this is hardly justice; however, as I said, it must be left to the good sense of the management.

A very important individual—the editor of the local paper, must not be omitted, he is a man whose pen might work wonders, consequently it is well to keep on the right side of him.

Many people will not trouble about purchasing tickets beforehand, and money is not *supposed* to be taken at the doors, so arrangements should be made for obtaining tickets as near as possible to the entrance.

In my second part I will say a few words respecting how to ensure the success of the exhibition itself.

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Discs and their Relation to the Lens.

We have had such a great demand for the back number of this journal containing this table, that we here reproduce it:—

When one is called upon to give a lantern entertainment in a hall or room, the following questions will be uppermost in the mind of the operator :—(1) What size of disc can be obtained with a lens of a certain focus? (2) How far distant from the screen must the lantern be placed in order to get a disc of a certain size with a given lens of ascertained focus? Doubtless many more questions will arise, but these mentioned will be of the most importance. It is a "rule of thumb" practice for an operator to wheel his apparatus up and down a room in order to find the desired position from which to officiate, and the minds of any spectators will not be confirmed in the idea that the exhibitor thoroughly understands his business. How very much more simple and satisfactory is it to reason thus before starting for the place of entertainment. A screen of — feet diameter is required, so if I bring a lens of — focus the lantern must be — feet from the screen, the length of the room being of course taken into consideration in order to ascertain that it is possible to erect the lantern at the desired distance. This having been ascertained beforehand, all that is required is to take an objective of the desired focus and measure off the necessary space between the screen and the place where the lantern should be set.

Supposing we are called upon to operate the lantern in a hall 25ft. in length, we first ascertain the size of disc desired, which we will suppose to be 10ft. With an objective having a focus of 6in., how far from the screen must the lantern be placed in order to produce a 10ft. disc?

Here is the rule by which it can be ascertained.

Let A = focus of objective.
,, B = diameter of slide.
,, C = ,, disc.
,, D = distance between the lantern and screen.

Multiply the diameter of the circle required (C) by the focus of the lens (A) and divide by the diameter of the slide (B).

$$\frac{C \times A}{B} = D = \frac{10 \times 6}{3} = 20 \text{ feet.}$$

It is thus seen that in order to produce a 10ft. disc with a 6in. objective, the lantern must be placed 20ft. from the screen.

On the other hand, we may possess several lenses of different foci, and it is necessary that the screen and the lantern must occupy certain positions which we will suppose to be just 20ft. apart, and that the diameter of the disc must be 10ft. How are we to ascertain whether we must use a lens of 4, 5, 6, 7, or other number of inches in focus?

Multiply the distance between the lantern and the screen (D) by the size of opening of slide (B) and divide by the size of disc (C).

$$\frac{D \times B}{C} = \text{A focus of lens} = \frac{20 \times 3}{10} = \text{6in focus.}$$

Again: We have a lens of 6in. focus, and intend that 20 feet shall intervene between the lantern and the screen, and wish to know what size of disc can be produced. In order to calculate this it is necessary that we multiply the distance between the lantern and the screen (D) by the size of slide opening (B), and divide by the focus of the lens used (A), which gives us

$$\frac{D \times B}{A} = \text{C size of disc} = \frac{20 \times 3}{6} = \text{10ft. diam. of disc.}$$

The following Ready Reference Table has been computed by the foregoing rule, and by a glance it will show the relations between lantern and disc with object-glasses of every focus from 4in. to 15in.

READY REFERENCE TABLE.

Distance between Lantern and Screen	FOCUS OF LENS.																								Distance between Lantern and Screen
	4in.		5in.		6in.		7in.		8in.		9in.		10in.		11in.		12in.		13in.		14in.		15in.		
	DIAMETER OF DISC.																								
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	
10 feet	7	6	6	0	5	0	4	3	3	9	3	4	3	0	2	9	2	6	2	4	2	2	2	0	10 feet
11 ,,	8	3	6	7	5	6	4	9	4	2	3	8	3	4	3	0	2	9	2	6	2	4	2	2	11 ,,
12 ,,	9	0	7	2	6	0	5	2	4	6	4	0	3	7	3	3	3	0	2	9	2	7	2	5	12 ,,
13 ,,	9	9	7	10	6	6	5	7	4	11	4	4	3	11	3	7	3	3	3	0	2	9	2	7	13 ,,
14 ,,	10	6	8	5	7	0	6	0	5	3	4	8	4	2	3	10	3	7	3	3	3	0	2	9	14 ,,
15 ,,	11	3	9	0	7	6	6	5	5	8	5	0	4	6	4	1	3	9	3	6	3	3	3	0	15 ,,
20 ,,	15	0	12	0	10	0	8	7	7	6	6	8	6	0	5	6	5	0	4	7	4	3	4	0	20 ,,
25 ,,	18	9	15	0	12	6	10	9	9	4	8	4	7	6	6	10	6	3	5	9	5	4	5	0	25 ,,
30 ,,	22	6	18	0	15	0	12	10	11	3	10	0	9	0	8	2	7	6	6	11	6	5	6	0	30 ,,
35 ,,	26	3	21	0	17	6	15	0	13	1	11	8	10	6	9	6	8	9	8	1	7	6	7	0	35 ,,
40 ,,	30	0	24	0	20	0	17	2	15	0	13	4	12	0	10	10	10	0	9	2	8	6	8	0	40 ,,
45 ,,	33	9	27	0	22	6	19	3	16	10	15	0	13	6	12	3	11	3	10	4	9	8	9	0	45 ,,
50 ,,	37	6	30	0	25	0	21	5	18	9	16	8	15	0	13	8	12	6	11	6	10	9	10	0	50 ,,

Examples.—An 8in. focus lens at a distance of 35ft. will give a disc of 13ft. 1in. To produce a disc of 12 ft. with a lens of 10in. focus, the lantern and screen must be separated by 40ft. To produce a disc of 15ft. at a distance of 45ft. will require a lens of 9in. focus.

How to Renovate a Lantern.

Brass Work. No. 3.

By C. Goodwin Norton.

Every lanternist knows that the polish on the brass work of a lantern has nothing whatever to do with its optical qualities, but whether a lantern is to be sold or used for exhibition purposes, its outward appearance exerts a great influence on the purchaser or beholder.

Brass is capable of receiving polish equal to that of any of the metals, but unfortunately it as readily tarnishes on exposure to the atmosphere, or to the fumes of chlorine, sulphur, &c., as when oxygen gas is being made, or where there is disinfecting powder used, from badly calculated gas burners or oil lamps. To prevent this rust or tarnish, it is usual for the lantern maker to thinly coat the brass work with transparent gum, generally shellac, dissolved in methylated spirit, on which these fumes have little or no deteriorating effect.

This coating of shellac or lacquer is made to adhere to the brass by heat, but as it must necessarily be very thin, care should always be taken to prevent it being scratched or rubbed, as old brass can never be repolished and made to look so nice as when it first leaves the maker's hand.

It has been gravely advocated by some who ought to know better, that the use of somebody's soap—which, to have any effect on the lacquer or brass work, must contain a spirit, strong alkali, or a grit of some sort—is capable of polishing all kinds of photographic apparatus. Certainly if the brass were not lacquered, some of these will procure a good shine, which would look very nice if done every few days; but few can either afford the time or take the trouble of spending a couple of hours doing work of such a dirty character as cleaning brass every time the lantern is to be used, which would certainly be the result if one depended on the soap mentioned.

The only way in which lacquered work can be kept clean, is by carefully wiping with a soft leather, and handling as little as possible.

In spite of every care, spots and scratches will appear on the surface, and if the lacquer be quite removed, these spots will become black. If they are small, and not in prominent places, it is well to leave them alone, but should they disfigure to any appreciable extent, a simple way to remove them is by gently rubbing with polishing paste or powder, such as can be obtained at any oil shop, taking care not to make the place larger, and afterwards to apply a little lacquer with a camel hair brush.

Dalton's cold lacquer will be found especially useful for this purpose, as it can be applied without heat, and any desired colour matched.

To relacquer the whole of a lantern front and stages, is rather a large order for an amateur to undertake, and cannot well be done without special appliances, such as a proper oven and a lathe for repolishing the circular parts; but he might manage some of the smaller pieces.

There are several methods of removing old lacquer from brass work. Boil it in a solution of borax in soft or rain water, or any strong alkali can be substituted for the borax, common washing soda being the most convenient. What is known as American potash can be dissolved in water and applied cold, but it is nasty stuff to use, it stains and burns the hands, and is liable to spoil one's clothing, and in fact almost anything it may happen to come in contact with. Another way is to mix methylated spirit and ammonia together, and rub a rag impregnated with this over the metal work.

This having been done, any part requiring it may be repolished with fine emery cloth or powdered emery and tallow, and afterwards brick-dust, and then a finish given with whiting. Care should be taken to rub the metal with the grain, or it will always appear scratchy, unless an exceedingly high polish be imparted. The lacquer can be purchased at an oilman's, and, as a rule, will be found more reliable than any that can be made at home, but should the amateur try to make his own, here is a good formula:—

Methylated Spirit	1 pint.
Shellac...	3 oz.
Turmerac	½ oz.
Saffron...	2 oz.
Anotto...	1 drachm.

This makes a fine gold lacquer. It is, however, a good plan to mix the first two as a stock solution, and keep the latter dissolved in a little spirit separate so that any required colour may be made, other tints may be made with dragon's blood, gamboge, &c.

The following are two methods of lacquering: one is to heat the article to about 212° (boiling water), then to apply with a soft brush, taking care not to get the lacquer streaky, and let it cool gradually. The other is to apply cold or heated slightly, and then to stove or put it in an oven, the temperature of which should not exceed 230°. The brush used should be as wide as possible, and of the softest hair procurable; flat brushes suitable for the purpose may be obtained at 6d. and 8d. each, but smaller round ones from 2d. upwards.

When applying the lacquer, take as little as possible on the brush, draw it lightly over the surface, always with the grain, by this is meant in the same direction in which the brass was polished, care being taken not to get it in streaks or patches, nor to leave tears at the sides and end of the work.

The lacquer, consisting principally of spirit, dries soon, and two or three coats may be applied one immediately after the other. If the parts are likely to be much handled the lacquered brass should be stoved, *i.e.*, placed in an oven for several hours, at a temperature of 230°, not much higher, or the coating will turn brown, or perhaps a dirty black.

The chief difficulties the amateur will encounter are, when in polishing to get the marks or grain in one regular direction, and also get rid of the polishing medium without handling the surface. To ensure the metal being at one even temperature of about 200° some authorities recommend immersing a short time in boiling water, and applying the lacquer as soon as the steam has dried off the brass. Hold the work without touching with the fingers; here the amateur's ingenuity may be exercised to advantage; most parts of a lantern have a hole in them somewhere, and a handle can generally be made with a piece of wire and a pair of pliers or hand vice, other parts may be temporarily fastened to a board with a screw or two.

No time is lost in making a secure handle or stand, as one piece may drop on the floor and necessitate the whole process of cleaning, heating and drying being done over again. If the lanternist be fortunate enough to possess a lathe, the circular parts can be coated with the lacquer when revolving, by applying it with a silk rag or fine brush. The work first being made a little hotter than the hand can bear, by holding a shovelful of red-hot embers of charcoal underneath it, or a Bunsen's burner or common gas stove can be used for the purpose. Care must be taken not to smoke it.

—:o:—

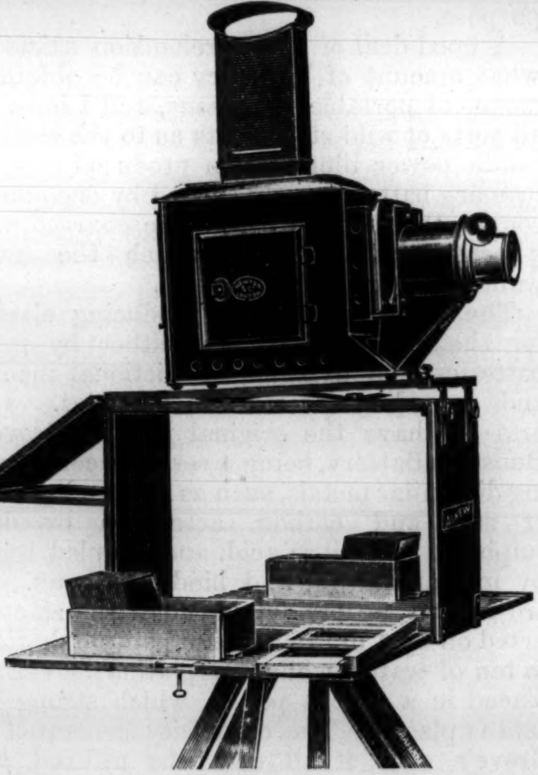
New Apparatus.

BI-TRI-SINGLE LANTERN.

THIS compound lantern, as its name implies, can be used as a single, bi-unial, or triple lantern, as it is composed of three separate and distinct mahogany bodies, which can in a moment be firmly attached to one another, without the agency of screws, or bolts. The fronts are tilted in a new way, as regards lantern matters, the principle of a camera swing back being adapted. When the lantern is set up, the fronts are drawn out a short distance, which enables them to be pivoted from the centre. By means of the thumb screw, at the top of each body, the coincidence of the discs, may at once be adjusted. An illustration will be found in our advertisement pages.

THE ASKEW STAND.

A few months ago (June), we stated that a party of cyclists had been giving a series of lantern entertainments, carrying the apparatus on their machines, and that, ten minutes after arrival, they were in readiness to commence the entertainment. The stand used for their lantern, is the invention of Mr. W. D. Askew, who has appointed Messrs. Newton & Co., Fleet Street, agents for same. From the cut, it will be observed that the sides of the lantern box form a table and stand, the upper part of which has a tilting table, whilst the reading desk has a double hinge, which enables it to fold flat with the case. Boxes, which are hinged at all corners, are provided for holding slides during an exhibition. These boxes are so constructed, that they fold flat against the lids. Mr. Askew lately visited our office, and immediately on entering, said "Look at your watch, and time me." We did so, and found, that in less than 4 minutes, he had unpacked his parcels, and rigged up his apparatus ready for an exhibition.



Respecting the idea of one brand of plates being better than another, I think I am quite right in stating that any or all will produce good results if treated according to their requirement, and I find that success generally attends the use of the formula issued with the plates.
C. BEADLE.

Electric Light for Lanterns No. 1

By Search Light.

The advances made in the distribution of electricity in cities, large towns, and places naturally adapted for supplying the necessary power for its generation, brings the electric light forcibly to the front as an illuminant for the optical lantern, and projection work generally. Such being the case, it may be of interest to refer to the improvements made in focus—keeping electric lamps, during the past 20 years, and descriptions of those suitable for the lanternist. Also to consider the methods of generating sufficient electric motive force (E. M. F.) for the purpose.

A good deal of misapprehension exists as to what amount of brilliancy can be obtained by means of portable apparatus, and I have heard all sorts of wild statements as to the amount of candle power illumination produced by a small primary battery, easily carried by one man. Of course the battery cells were charged with a "Secret" solution, for which the inventor wanted a large sum.

The three methods of producing electricity for the electric light, are either by primary batteries, the dynamo, or frictional machines, and secondary (or storage) batteries. In the first we have the original plan of Grove's or Bunsen's Battery, being a series of cells containing dissimilar metals, such as zinc and platinum, or zinc and carbon, acted on by diluted sulphuric and nitric acid, and coupled together by insulated wire, and binding screws. They are known as "two fluid cells," the zinc being acted on by a dilution of one part sulphuric acid to ten of water, while the platina or carbon is placed in a porous pot, in which strong nitric acid is placed. The electricity generated from Grove's cells, if all could be utilized, would represent about 2 volts for each pound of zinc consumed, but, according to Joule, in practical working it is only about one seventh of the theoretical amount.

If this is so, with a large and powerful battery, it follows with a smaller one, and as very little can be done in electric lighting of a practical nature, with less than 50 volts, a large number of cells is necessary to produce a light suitable for projection. 50 to 80 Grove's or Bunsen's, being usually employed in the old days in theatrical work, or for class demonstration. The fumes given off from these batteries made it necessary for them to be placed out doors, or in a draught cupboard or small room.

As 50 to 100 volts are necessary for the satisfactory lighting of an electric lamp for projection purposes, battery power has given place to dynamos, the electrical efficiency of which is far greater. Small machines are now made by reliable electrical engineers, with an output of 400 Watts, and having a lighting power of 20 to 50 volts, capable of illuminating an arc lamp of 2,000 candle power. This costs about £13. The next larger size is probably a more useful one, as the output is 700 Watts, and the voltage 50 to 100, while its capabilites are illumination of 1.5 arc lamps of 2,000 c.p., hence it will have a reserve of power, and this at a cost of £5 or so more

It may be useful here to state that the unit for expressing the activity of energy or work done in electricity is a Watt, and compared with one of the most common standards of comparison. One horse power is equal to 746 Watts. These dynamos cannot well be driven by hand, but water power is in many places available, and failing that, oil engines are now made that are self contained, and give from half to fifty horse power, according to size. They burn the commonest of hydro-carbon oils, and seem simple, reliable, and economical.

Where steam power is available, these small dynamos can be connected to convenient shafting, and driven as required.

The storing of electricity is a subject that has received considerable attention in the last few years, with the object of carrying to a distance for convenience, or having in reserve a certain amount of electrical energy. Various cells have been designed to form the units of these "secondary batteries," as they are called, and from reports of tests made by professor Ayrton, during the six months proceeding July of this year, it seems that the Epstein accumulators have been found most satisfactory. As these cells depend so largely on the amount of surface of the plates (positive and negative), they are, when powerful, both large and heavy; one cell, whose plates are 13½ × 12½ in. wide, × 13½ × 11¾ respectively weighing, with glass box and liquid, over 82 lbs.

The great advantage in electric lighting, of using the power from the storage battery, is that the light is more steady, the discharge of current being quite free and continuous, and not affected by vibration of engine, or movement of dynamos.

As regards electric lamps, those used in years gone by were the Duboscq, and the Serrius. The latter was very satisfactory when used by a capable operator, with a good battery. For those with dynamos, good lamps will be found in the Seimens small size focus keeping lamp, and used so successfully at the Society of Arts; the Brockie lamp, as used by the Royal Institution, besides which there are others no doubt successful, which I have not seen worked. In optical projection apparatus, the great thing is to get one point of illumination only in the light, and the automatic, or other adjustments of the carbons are designed to this end.

Resistence by coils is necessary or desirable to bring down the current to the minimum, that shall give the desired illumination.

Taking the Siemens small size differential lamp as an example, the light is perfectly under control, and the works are contained in a base that occupies little room. It will in fact work with almost any lantern, if the body is raised to suit the length of the carbons, and the base of the lantern is open.

For small discs the "Focus incandescent lamp" is very useful, as a disc of 8 to 12 feet can be obtained with the 100 candle power pattern. The great advantage of this for home use and experimental work, is that once in position and adjusted for centre of optical system of lantern, it is only a question of making the connection with the electric supply, or switching on the current, to get the apparatus ready for use, and project pictures, &c., on the screen.

—:o:—

An Amateur Saturator and Jet.

No. III.

By Clericus.

I now proceed to give particulars of a few modifications which I subsequently made in the jet already described. They principally relate to the gas-chamber, the nipple, and the lime-turning arrangement. Under these three heads I shall deal with them. The rest of the jet remains unaltered, with the exception of what I have called the "Side-tubes." These, instead of being curved upward as shewn in the last paper, are bent into the form indicated in Fig. 1, which gives their appearance, viewed from above, before the other parts of the jet are added.

The part *x*, where the tubes are soldered together, goes into one side of the gas-chamber, and should be long enough to reach through it to the further end. The ends are closed, and a row of small holes drilled in the side of each tube to admit the gases into the chamber.

1. The gas-chamber. This is made up of three parts. The lowest is of brass tube 1in., or rather more in diameter, and about $\frac{3}{4}$in. deep. I altered mine into the form of a square. But further thought has convinced me that there is nothing gained by doing so. Whichever form is adopted, the side tubes must be inserted into one side as at *a* (Fig. 2), and plates of brass cut for the top and bottom of the chamber. *c* is a piece of brass tube about $\frac{1}{2}$ in. long, and just large enough to go through the top of the chamber, leaving about $\frac{1}{8}$ in. all round. These may all be screwed together, as in the former jet—unless the square form be adopted—in which case of course the top and bottom of the chamber will have to be soldered.

Before putting these together, I inserted a piece of gauze, No. 50, beetwen the tubes and the top of the chamber. If this is done, the tube *c* may be filled with granulated pumice, and the chamber itself becomes a flame extinctor. The tube *d* is about $\frac{1}{2}$ in. long, and is made to screw into *c*. The top of it is closed with a disc through which the tube *e* passes. I need hardly add that great care must be taken to make all these joints gas-tight.

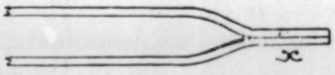


Fig. 1.

2. The nipple. The tube *e* which carries the nipple is of copper, $\frac{1}{4}$ in. diameter, and should be solid-drawn. It is bent, as shewn in the figure, enough to make the nipple deliver the gas upon the lime at the proper angle, *i.e.*, about 40° from the perpendicular to the surface of the lime.

The nipple itself, *f*, is made of brass rod or stout wire, large enough to screw into *e*. I first cut the screw upon one end for about $\frac{1}{4}$ of an in., and then cut off a length of about $\frac{5}{8}$ in., of which, of course, $\frac{1}{4}$ in. was screwed, and $\frac{3}{8}$ plain. Fixing this in the lathe, and beginning from the screwed end, I drilled this almost through, leaving something less than $\frac{1}{8}$ of an inch. This was done with as large a drill as the rod would bear. Then with a fine drill, made of part of a knitting-needle, I drilled the remaining portion by hand, and then filed the plain part of the outside into shape. I made two or three of these nipples, with holes at the point of different

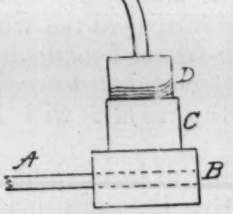


Fig. 2.

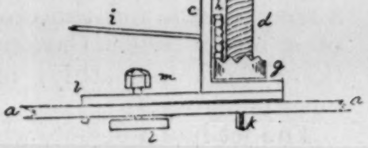


Fig. 3.

sizes. It is thus very easy to use any size aperture you may require, by simply screwing the proper nipple into the tube *e*. If there is any suspicion of leakage—which need not be the case if the screw is carefully cut—a little white lead will make all tight.

3. The lime-turning arrangement. The basis of this is a strip of thick brass (*b*, Fig. 3), about 1¾ in. long. It is beveled at the sides so as to sink partly into the space between the side tubes. And one end is turned down (at *b*), and filed to fit between the tubes. The frame, *c*, is soldered to the strip just described. The tube *d*, is screwed into the top of the frame, and serves to keep the crown wheel *g*, in its place. This tube *d* has a disc *e*, soldered to the top of it, and the screw of the lime-pin *f* works in this disc. The lime-pin is filed square at the lower part (*k*), for a little more than an inch, and this passes through a square hole in the bottom of the crown wheel *g*. The action will be readily understood. The spur wheel *h*, being turned by the rod *i*, acts upon the crown wheel *g*, which causes the lime-pin to turn also. The screwed part *f*, working in the fixed disc *e*, raises or lowers the lime-pin according to the direction in which it is turned. The skip *l*, is placed transversely on the under side of the side-tubes, and has a screwed pin fixed in it, which passes through the strip *b*, and a nut *m*, fixes the whole arrangement at the required distance from the nozzle. The rod, *i*, is fixed by a small loop of metal to the side of the tube, by which the jet is supported, and has a small button at the end for the purpose of turning it. This rod is in many jets made long enough to bring the button out beyond the taps of the jet. I believe it is more out of the way if the button is placed between the taps and the supporting tube.

If there is any difficulty in procuring the little wheels, *g* and *h*, they may be cut out of brass, and the teeth formed with a small file. The remains of a small time-piece furnished me with a spur wheel, and the crown-wheel I made out of a bit of tube. Care must be taken to make them work smoothly, or the result will be unsatisfactory.

The jet has a defect, which will be obvious at a glance. The screw on the lime-pin being necessarily of a fine thread, it requires several turns of the pin to raise the lime to an appreciable extent. In jets now made, this is obviated by having a spiral groove with a long pitch instead of a screw, so that one turn of the rod will raise the lime a quarter of an inch or more. This, however, is attended with the disadvantage that, when the parts get loosened by wear, the spiral is apt to slip down of itself. To prevent this, in the jet which I last bought, there is a small hexagonal disc fixed upon the rod, and a spring pressing against the sides of the hexagon prevents it turning of itself. I do not find this a satisfactory arrangement. It causes the thing to turn with a jerky sort of motion. And, moreover, the spring is very liable to slip aside, and may prevent the rod from turning. In the arrangement I have described, there is, of course, no risk of the lime-pin slipping down. And, after all, the defect I have mentioned is not a serious one. There is no difficulty in getting a fresh surface on the lime as often as you require. If proper care is taken in fitting the parts together at first, they are not likely to get out of order, and there is little risk of any hitch afterwards. I have used my jet many times since I made it, and it has always worked with perfect freedom. I cannot say as much for other jets that I have used, even by well-known makers.

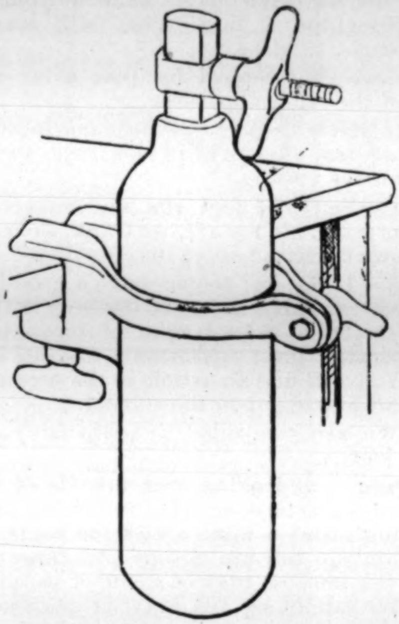
I have now described, as clearly as I was able, the entire apparatus. It has caused me much interest in the construction, and given great satisfaction in the using. If my remarks prove serviceable in any way to a brother amateur, I shall be very glad. For any one who is at once a lanternist and an amateur worker, it is quite worth the while to make one, and it certainly will not prove an expensive venture. For I think I am within the truth when I say that the entire cost has not exceeded five shillings. I may add in conclusion, that I should be happy at any time, to give further explanation with regard to details, should any one take sufficient interest in the matter to desire it.

—:o:—

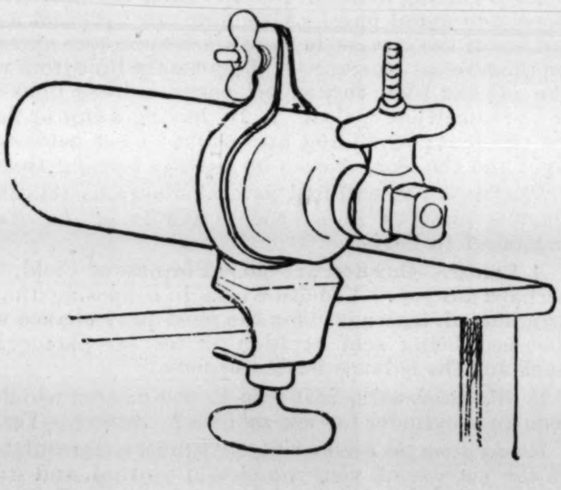
Gas Bottle Supports.

NOW-A-DAYS people expect as many labour-saving devices as possible in connection with lantern apparatus. Much has been introduced in connection with different articles, which, if not absolutely necessary, are yet handy to have. In connection with a lantern entertainment, it is essential that there be no hitch of any kind, and when using cylinders, they should be secured in position in such a manner that there is no likelihood of them falling down if used on end, or of rolling about if used in a horizontal position. Many have in the former position used a piece of string to tie the bottle, say, to the leg of a table, whilst in the latter case a small wedge or a book has sufficed.

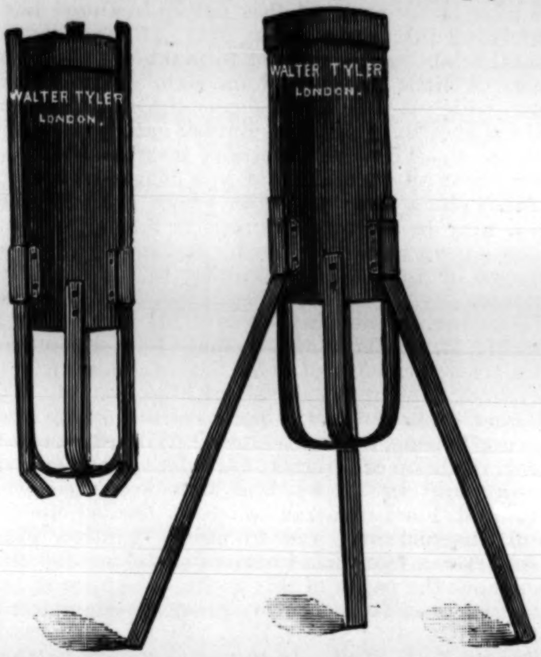
If we rightly remember, Mr. Henry Brier, of The Scotch and Irish Oxygen Co., was the first to introduce a special metal stand for cylinders, consisting of a ring to which was rivetted three legs; the cylinder was placed on end, so that the ring surrounded the bottle. The stand was of course placed upon the floor.



A support of a different character was brought out by the Gas Compression Co., of Manchester. This is more of the form of a clip than a stand. In this case a spring ring (fig. 1 & 2) is placed upon the bottle, and firmly secured by tightening a screw —fastened to this ring is a grip, not unlike that of a bench vice—by which the cylinder may be screwed on the edge of a table or ledge, and the cylinder either held upright at the side of the table or secured from moving whilst lying upon the table itself, according to the shape of the grip, two styles of which are made.



Another form of holder, a modification of the first mentioned, has just been perfected by Mr. Walter Tyler of Waterloo Road. It is intended to be carried on the cylinder during transit, and occupies practically no extra room. When the cylinder is to be used, the legs are simply withdrawn from places and inserted other end up. After use the reversing of the legs at once forms it into a parcel (fig. 3) devoid of projections.



The Lantern Society.—Commencing on 10th, inst., the usual meetings will be held at 20, Hanover Square, W., at 8 p.m. An American set of slides will be available for the use of members; and a list of loan collection and exchange slides will shortly be issued. October 10, Exhibition of slides (set going to America). October 24, new form of lantern in aluminium, will be shown. November 14, Annual Meeting; Exhibition of slides from America. November 28, Exhibition for members and friends. December 12, "Photography and lantern applied to medicine," by Mr. Andrew Pringle.

Editorial Table.

Weeks' List.—Mr. Frank Weeks, of 21, Thorpe Road, Forest Gate, has brought out a new list of designs for slides that he has in stock, and also the relative costs for designs for certain classes of subjects. The list also states that the artist is prepared to make drawings for illustrating MSS. We have seen many such drawings by Mr. Weeks, and we must say that he possesses a wonderful degree of imagination, and is able after reading a description of any incident, to sketch just such a picture as is suited to requirements. Under the heading of zoological subjects we observe a great range, "from a megalosaurus to a microbe." This list is sent on receipt of one stamp.

Slide Colours.—Mr. A. W. Scott, of 401, Cambridge Road, Cardiff, has sent us an assortment of transparent colours, which he has lately compounded. We have tried them, and find that they can be easily applied, and are very rich and transparent. These colours are in thick liquid form, and are applied with a brush, but are not adapted for dabbing with the finger, nor is this required with them. We have also found that these colours are admirable to use as a cold lacquer for metal work; they dry very hard and set soon after applying.

Rubber Stamp Photo Catalogue.—Mr. Wm. Tylar, of Birmingham, is sure to get hold of a novelty if it be a good one. A short time ago we received an invitation to send our photo and receive in return a rubber stamp. We have lately received this put up in a neat box, also containing ink, slab, roller, &c. After a few experimental trials, one is enabled to make excellent impressions. A little ink is laid on slab, worked even with roller, which is then applied over the surface of stamp. The impression given is of similar nature to a Meisanbach block. The cost, according to style, is 7/6 to 12/-, put up with all requirements in a neat box 4×1¾×½ in. In Mr. Tylar's new catalogue which has just come to hand, may be seen an impression taken from such a stamp as we have described. It also contains about 90 pages of apparatus pertaining to photography and lanterns.

Catalogue.—A new catalogue of 104 pages, is to hand from Mr. R. H. Clark, of Royston. Lanterns of various kinds are described, and as for lists of slides, we find that the names of them occupy about 80 pages.

Hand Camera and how to use it.—Illiffe & Son, London. This useful book, by Mr. Walter D. Wilford, is, to a large extent, made up of a series of articles which appeared in *Photography*. In it we find that every conceivable portion of hand cameras has been treated upon, and useful instruction given to users. Ninteen pleasing reproductions from hand camera shots, are distributed, throughout the pages of this book. The price is 1s.

Photographic Reproduction Process.—Hampton Judd & Co., 13, Cursitor Street, E.C. By P. C. Duchochois. Edited by E. J. Wall.—In this work we find particulars of the Cyanotype or blue process, The Juk, Cuprotype, Aniline, Primuline, and Feer processes. Photogaphing upon metal, for engraving, is treated upon, and particulars given of the Uranotype, Platinotype, Carbon, powder, and various other processes.

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Correspondence.

TO PUT OUT ETHER LIGHT.

[*To the Editor.*]

Sir,—I notice in the article on Saturator and Jet, Clericus says, "In putting out the light, turn off the oxygen first." This is a mistake. This would cause the ether light to rush back when it is turned off, and go out with a snap, which is not pleasant. The ether light should be turned off first, and oxygen left on until the lime has cooled down a bit, then there is no danger of the snapping out.—Yours, &c., E.L.

ILLUMINATION IN DRY AND WET WEATHER.

[*To the Editor.*]

Sir,—I have repeatedly noticed during a long series of exhibitions, that I am better able to obtain a brilliant image on the screen in dry weather than in wet. At the light itself I have not been able to discern a difference, but to my mind a great contrast is perceivable on the screen. When we have a spell of dry weather, and the atmosphere is dry, I can always fine illumination; but during wet weather there seems to be a very great loss of light. The light as an illuminating point appears to be the same, but by the time it reaches the screen a lot of it seems to be gone. Now, Mr. Editor, if you will kindly insert this letter, others may have noticed the same effect, and will, perhaps, give their experience. It is quite possible that my eyesight may be beginning to fail, and that the difference of light may be imagination on my part. It is well known that the state of the weather has an influence on the tones procurable from a violin, may it not also have something to do with the penetrating of rays of light?—Yours, &c., AGNOSTIC.

Notes and Queries.

Stephen Bretton.—We have handed your letter to Messrs. Houghton & Son. They will send you the desired samples of glass.

M. Simpson.—We replied by post after seeing the inventor of the other apparatus.

Mr. Scott writes to say: "he does not intend to reply to Mr. Pumphrey's remarks in last issue, as it will only lead to 'abusive writing.'"

W. Allen.—You will find the address of a Chicago firm in this issue. They are, we think, to bring out the apparatus we described on p. 106 (Sept. 1).

C. Smiles.—1. Several people make a good living with the lantern. 2. Advertising is the only way. 3. The Qualifications are—a good man of business, a good lantern operator, good spokesman, and an interesting subject. You will find an article in the present issue by W. Kirkland bearing upon the subject.

Optic.—We are compelled to postpone your subject until next journal.

Yeo writes: "In looking over my file of journals, I came across an article on aluminum, but cannot find out anything about a light solder for using with this metal. Can you tell me of one?" *Answer.*—A good solder for the purpose may be made of cadmium, zinc, and tin. We cannot say the exact proportions, but for a strong solder the proportion of cadmium must be in excess; for great adhesion zinc should be in excess; whilst if it is necessary that it take a high polish there should be large proportion of tin.

Bottle asks "the probable cost of a steel cylinder to hold 10 feet of gas." *Reply.*—From 30/- to 35/-.

J. W. Cates (Montreal), writes:—"I wish to ask through your paper the cause, when dissolving, of the picture getting indistinct slowly after the dissolving is done, and not at once. Also, how can I prevent a faint outline of the picture in the darkened lantern appearing on the screen. *Answer.*—1. Because the lime from which the gas has been turned off emits a little light until it has somewhat cooled. 2. By having a cap or flasher on the lens; by sliding an opaque object between the light and the lens, or even by slightly turning the lime.

Shadow.—You will find several diagrams relating to shadow pictures in a recent volume of *La Nature*, published in Paris.

A Reader.—Our first article, "Flatness of Field," may perhaps aid you. You are wrong in supposing that the grinding of lenses is "for the most part chance work, the best being sold at high prices for photographic work and the balance for lanternists."

F. W. Lewis asks, is it safe to use oxygen which has been in a cylinder for six months? *Answer.*—Yes.

Reader from the First writes: "I must congratulate you on the success of your wonderful journal, and cannot imagine how you manage to give us so many interesting articles each month. It is a marvellous pennyworth. *Reply.*—Thanks for your sentiments. Does this month's journal also please you, both as regards quality and quantity.

"OUR LITTLE JOURNAL GETS ABOUT A BIT."

Mr. Frank F. Weeks, when settling his account and renewing his advestisement writes: "As the result of my advertisements in your journal, I am receiving some very flattering orders, even from America, New Zealand, Australia, and other remote parts. So it is evident that 'our little journal gets about a bit.'"